Zero-order considerations for SMTF design

- Total length ~**70 meters** (from cathode to high energy dump)

  - Gun + 2 booster cavities: **6.15 m**
  - 3.9 GHz acc cavity + bunch comp. + matching section: **10.14 m**
  - Main linac [TTF-2 (eventually three Acc modules)]: **39.15 m**
  - High energy diagnostics section: **14.90 m**

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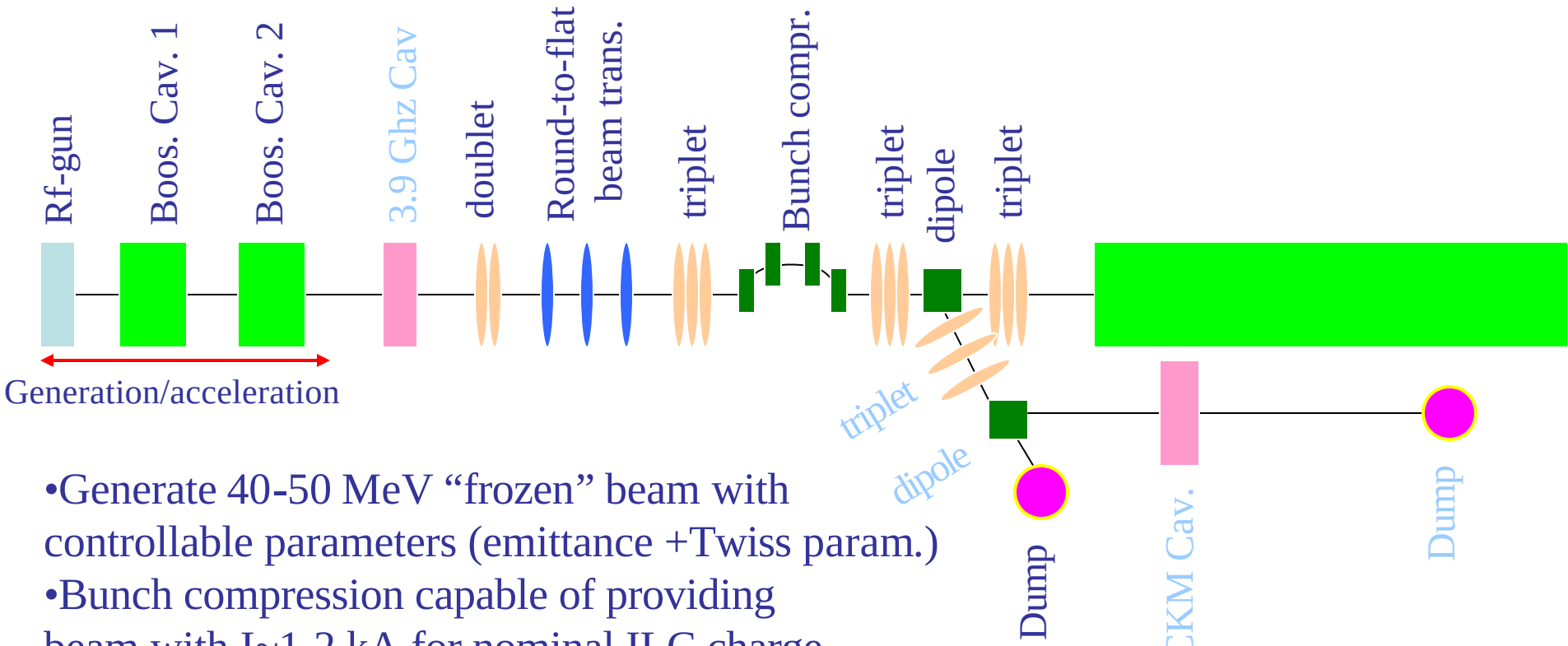
total length (from cathode) = 70.3 m

Injector

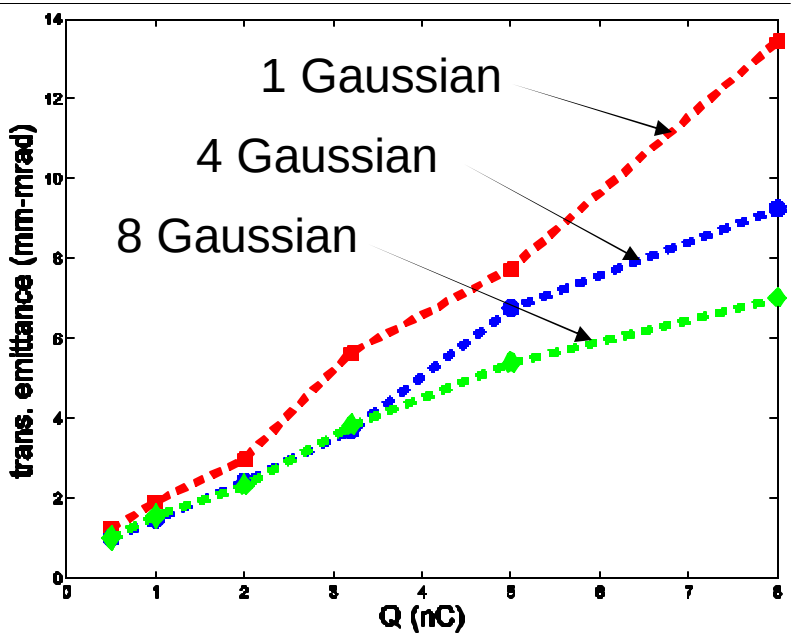


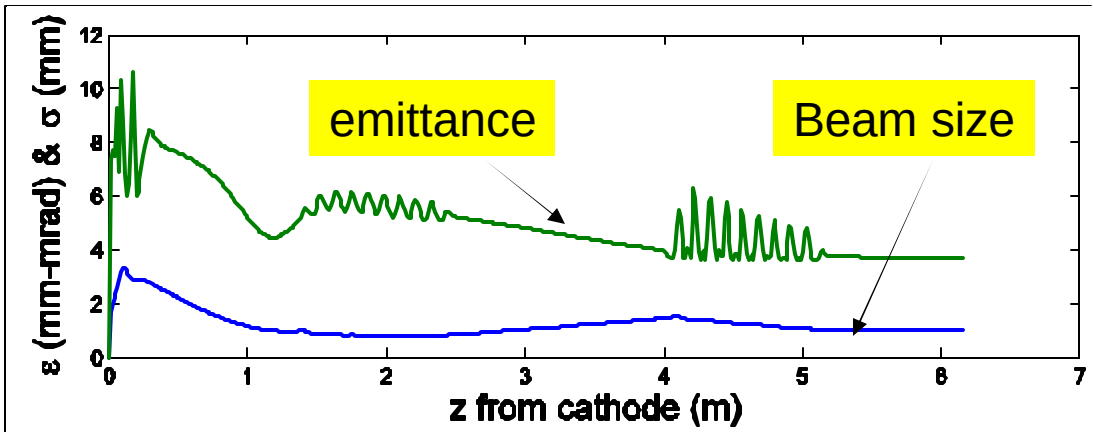
- Generate 40-50 MeV "frozen" beam with controllable parameters (emittance +Twiss param.)
- Bunch compression capable of providing beam with I~1-2 kA for nominal ILC charge
- Possibility to generate asymmetric emittance beam (ideal to study emittance growth in one-plane in cryomodules)
- Incorporate diagnostics + room for proper instrumentation (e.g. for HOM measurement)
- **Possibility of an off-line beamline for other test (CKM-based bunch length meas., or other advanced instrumentation/beam physics experiments)**

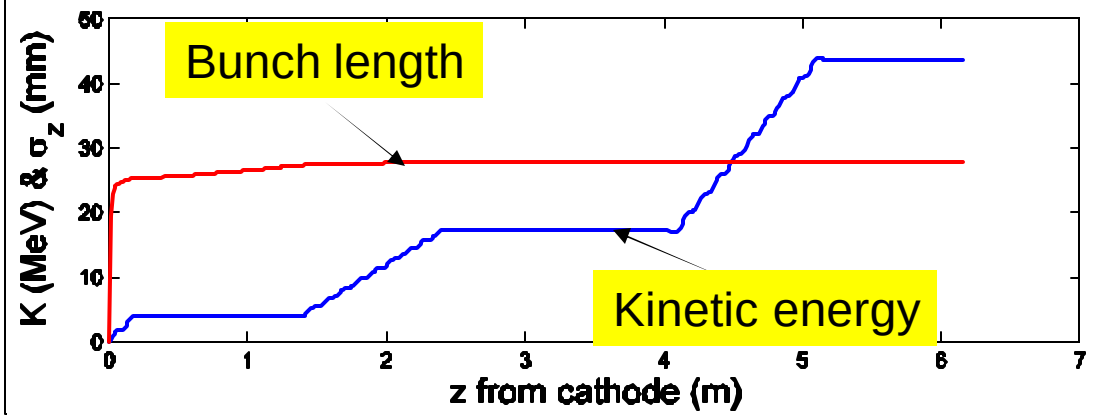
Generation and acceleration section

- **First set of simulations assume only two cavities (1.3 GHz)**
- Generate 40-50 MeV "frozen" beam with controllable parameters (emittance +Twiss param.) for a wide range of charges (optimized with generic optimizer `sddsoptimize`)

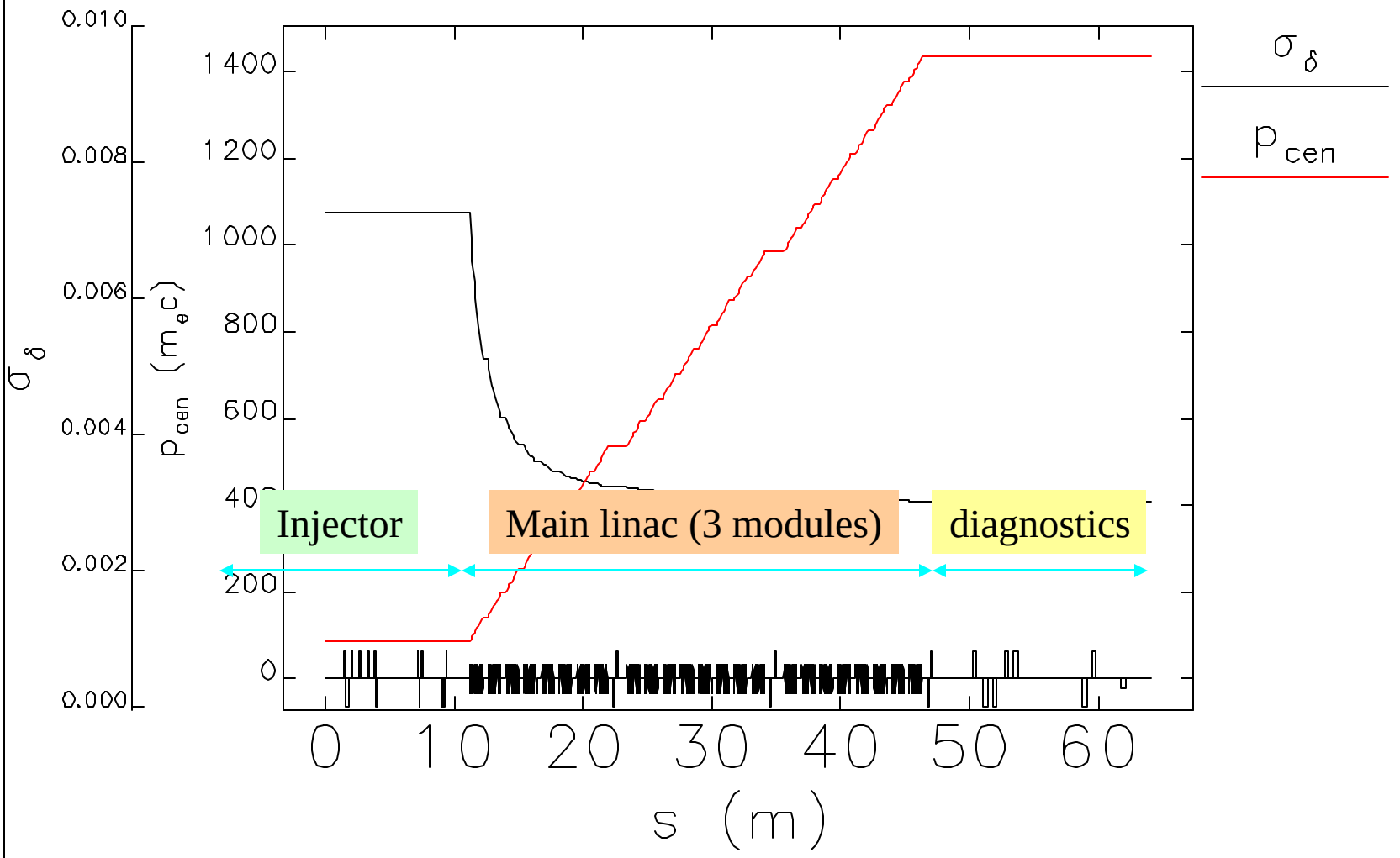
- Emittance vs Q for different laser longitudinal profiles





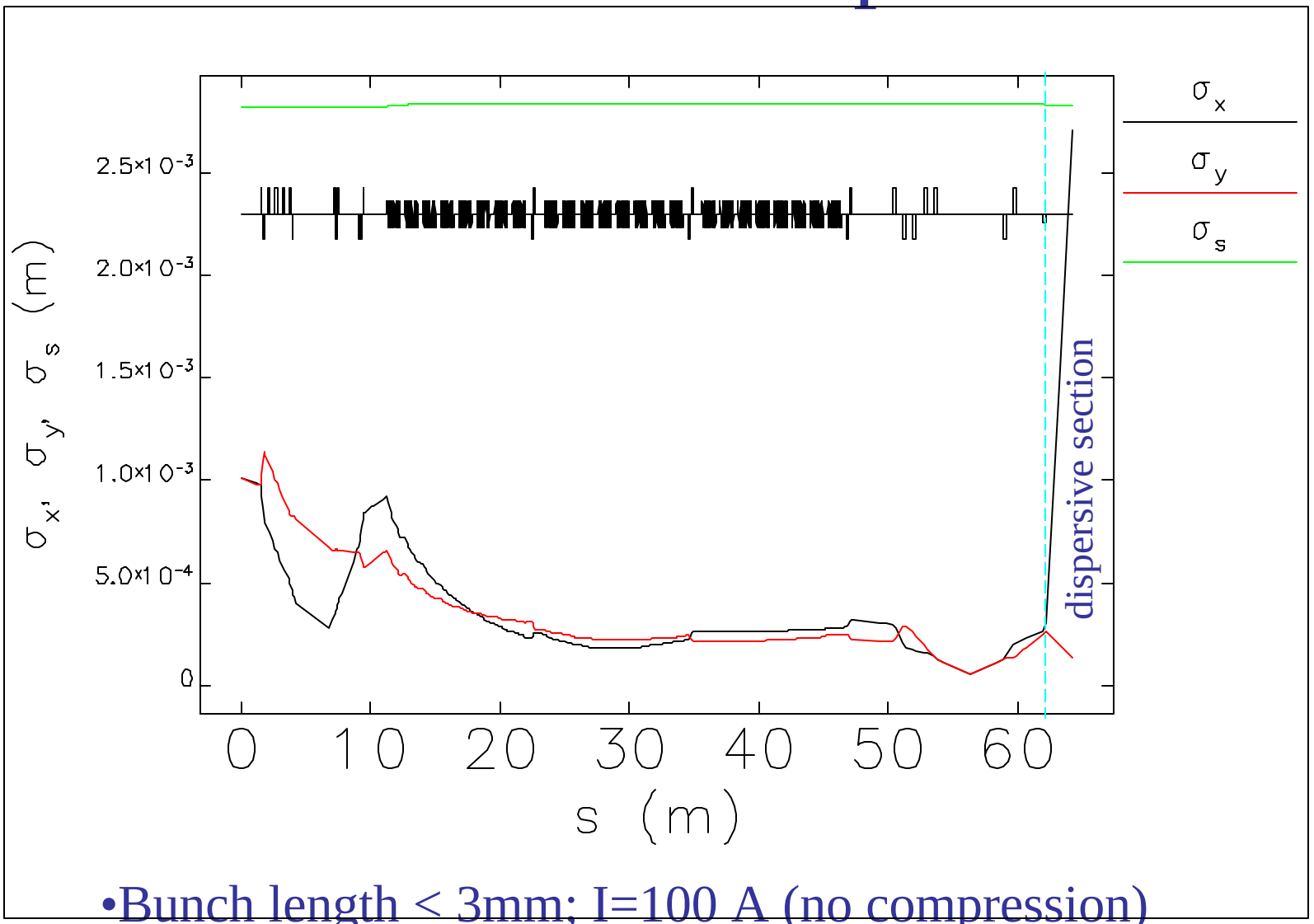


Momentum



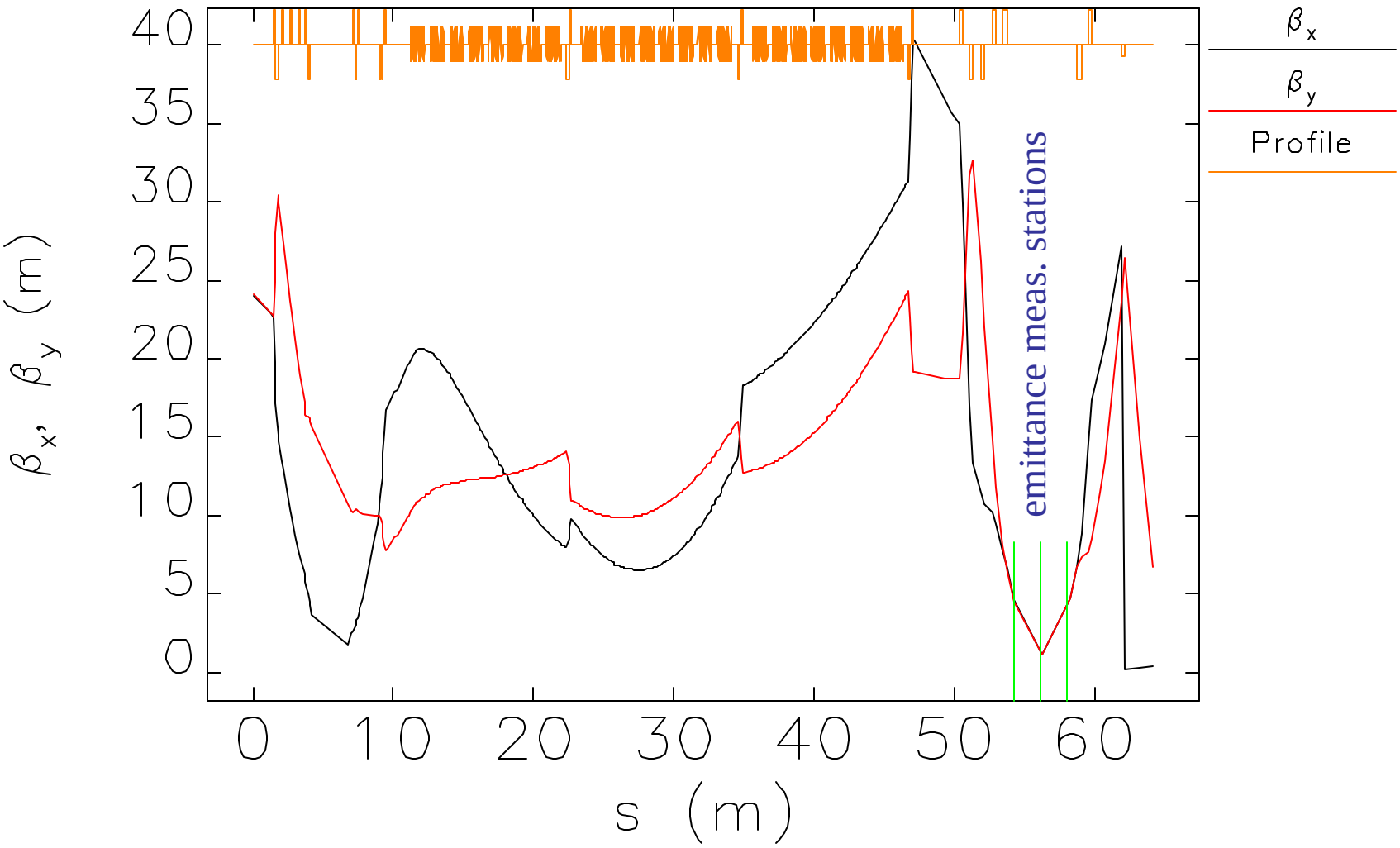
- Cavity in three modules operated at 25 MV/m average acc. Gradient
- $\gamma \sim 1400$ and $\delta\gamma/\gamma \sim 0.3\%$ (with present initial bunch length)

Beam envelopes



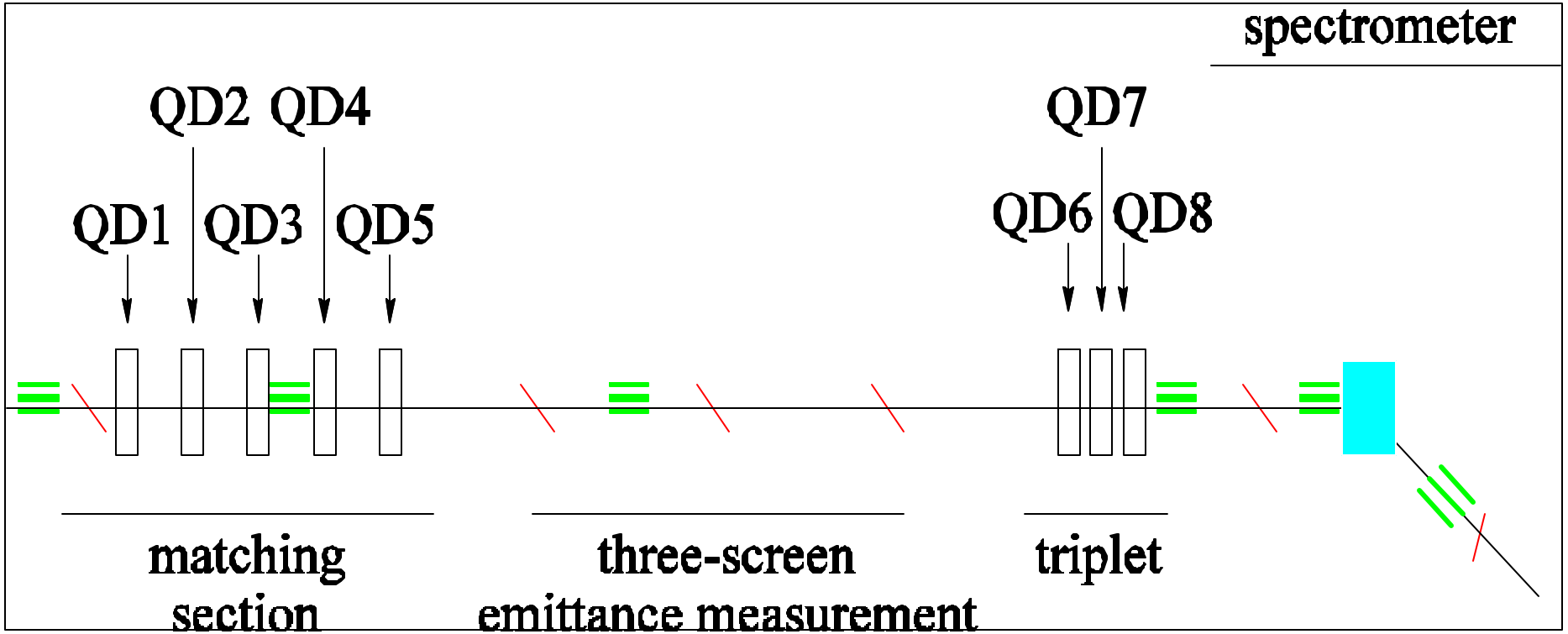
- Bunch length < 3mm; I=100 A (no compression)
- Transverse envelope < 1mm (in non-dispersive section)

Beta-functions



- Beta functions

High energy diagnostics section



- Momentum (mean and rms) both single bunch and multi-bunch
- Transverse and longitudinal emittances
- Test area for new ILC diagnostics development

Momentum (mean and rms) measurements

- Spectrometer with three BPMs: 2 upstream 1 downstream to remove incoming transverse position jitter
- Triplet (QD6,QD7,QD8) used to minimized β-function at position/profile monitor located in dispersive section

Transverse emittance measurements

- Fast emittance measurement using the three-screen technique (60 deg β phase advance between screens -- *matching provided by upstream quad quinplet*)

- Slower/more precise measurement using standard quadrupole scans in conjunction with tomographic methods

Snapshot of beam transverse density on the three-screen diagnostics